

CLAIMS

We claim:

- 5 1. A method for producing tyrosine hydroxylase-positive neurons,
comprising the steps of:
 - a) providing a human embryonic stem cell line; and
 - b) contacting said embryonic stem cell line with a solution
10 comprising at least one soluble molecule expressed by fetal striatal
cells, under conditions suitable for producing tyrosine
hydroxylase-positive neurons.
2. The method of Claim 1, wherein said fetal striatal cells are astrocytes
- 15 3. The method of Claim 1, wherein said fetal striatal cells are cocultured with
said human embryonic stem cell line.
4. The method of Claim 1, wherein said fetal striatal cells are separated from
said human embryonic stem cell line by a semipermeable membrane.
- 20 5. The method of Claim 1, wherein said at least one soluble molecule
comprises glial-derived neurotrophic factor.
6. The method of Claim 1, wherein said at least one soluble molecule is
25 provided by conditioned medium from fetal striatal cell cultures.
7. The method of Claim 6, wherein said conditioned medium is free of said
fetal striatal cells.
- 30 8. The method of Claim 1, further comprising contacting said human
embryonic stem cell line with stromal cells.

9. The method of Claim 1, further comprising step c, enriching said tyrosine hydroxylase positive neurons.

5 10. The method of Claim 9, wherein said tyrosine hydroxylase positive neurons are enriched, by selecting colonies with a circumference greater than 4 mm.

11. A cell culture produced by a method comprising contacting a human embryonic stem cell line with at least one soluble molecule expressed by fetal striatal
10 cells, under conditions suitable for producing tyrosine hydroxylase-positive neurons.

12. The culture of Claim 11, wherein said method further comprises enriching said tyrosine hydroxylase positive neurons.

15 13. The culture of Claim 11, wherein said at least one soluble molecule comprises glial-derived neurotrophic factor.

14. The culture of Claim 11, wherein said neurons are suitable graft material for human transplantation.

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15. The culture of Claim 14, wherein said human transplantation comprises treatment of a subject displaying symptoms of Parkinson's disease.

16. A method of alleviating Parkinson's disease symptoms in a patient with Parkinson's disease comprising:

- 5 a) providing a cell culture produced by a method comprising contacting a human embryonic stem cell line with at least one soluble molecule expressed by fetal striatal cells, under conditions suitable for producing tyrosine hydroxylase-positive neurons; and
- 10 b) administering said cultured cells comprising tyrosine hydroxylase-positive neurons to the putamen of a patient with Parkinson's disease, under conditions suitable for alleviating Parkinson's disease symptoms.

17. The method of Claim 16, wherein said at least one soluble molecule comprises glial-derived neurotrophic factor.

15 18. The method of Claim 16, wherein said alleviating Parkinson's disease symptoms is assessed by a technique chosen from the Unified Parkinson's Disease Rating Scale, the Schwab and England Scale, and the Core Assessment Program for Intracerebral Transplantation.

20 19. The method of Claim 18, wherein said patient has advanced Parkinson's disease.

20. A composition comprising at least one human embryonic stem cell and medium comprising glial-derived neurotrophic factor.

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21. The composition of Claim 20, wherein said glial-derived neurotrophic factor is a recombinant protein.

22. The composition of Claim 20, wherein said medium further comprises at
30 least one soluble molecule expressed by stromal cells.